Contact: Shelley Dawicki
508-495-2378
Shelley.Dawicki@noaa.gov

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Coral Hotspots Found in Deepwater Canyons off Northeast US Coast

Model Helps Predict Coral Locations

For the first time in decades, researchers have conducted an extensive exploration for deep-sea corals and sponges in submarine canyons off the northeastern coast of the US. The survey revealed coral "hotspots," and found that a new coral habitat suitability model could help predict where corals are likely to occur. The model is being developed by the Northeast Fisheries Science Center (NEFSC) and the National Ocean Service's Biogeography Branch.

Among the canyons surveyed during the July 6-18 cruise aboard the NOAA Ship *Henry B. Bigelow* were Toms, Middle Toms, and Hendrickson canyons off New Jersey, and Veatch and Gilbert canyons off Georges Bank. All of these were known or suspected habitats of deep-sea corals. More than 70 deepwater canyons, ranging in depth from 100 meters (about 330 feet) to more than 3,500 meters (about 11,500 feet), exist along the Northeast US continental shelf and slope. Few are well studied.

"The deep-sea coral and sponge habitats observed in the canyons are not like those found in shallow-water tropical reefs or deep-sea coral habitats in other regions," said Martha Nizinski of NEFSC's National Systematics Laboratory in Washington, DC, a zoologist and deep-sea coral specialist who served as the chief scientist on the research cruise aboard the NOAA ship *Bigelow*. "We know very little about the distribution and ecology of corals in the canyons off the Northeast coast," she said. "Although our explorations have just begun, we've already increased our knowledge about these deep-sea coral habitats a hundred times over."

Findings from this cruise will not only improve knowledge about deep-sea life off the Northeastern US, but will also aid the New England and Mid-Atlantic fishery management councils in their efforts to manage these habitats, which support a variety of fish species and other marine life.

The July survey on the *Bigelow* was the culmination of a larger mission to explore deepwater canyons, and gain increased knowledge of deep-sea corals. The *Bigelow* was one of three NOAA ships involved in the **A**tlantic **C**anyons **U**ndersea **M**apping **E**xpedition**s** (or ACUMEN), which has been used to document the deepwater canyons on the continental shelf and slope from Norfolk, Virginia, to New England. During February-June 2012, the NOAA ships *Okeanos Explorer* and *Ferdinand R. Hassler* extensively mapped offshore areas designated as priorities by the NEFSC deepwater coral research team and external partners.

Using high-quality multibeam sonar maps, NEFSC scientists and collaborators explored the deepwater canyons in the Northeast. Cruise objectives included gaining a better

understanding of deep-sea coral diversity and distribution in the region, and testing the accuracy of a habitat suitability model to predict where deepwater corals exist in the Northeast.

Bottom topography, as well as various other environmental factors, historical coral records, and model predictions helped guide the search and sampling of coral habitats. The science team aboard the *Bigelow*, using *TowCam*, a towed deep-sea digital imaging system operated by researchers from the Woods Hole Oceanographic Institution (WHOI), was then able to photograph what was on the bottom at the sites they chose, which was important for groundtruthing the modeling data.

Many corals observed during the *Bigelow* cruise live at depths between 200 and 2,000 meters (roughly between 650 and 6,500 feet deep). Although no specimens were collected during this expedition, more than 38,000*TowCam* images will be analyzed in the coming months. Data derived from these images will be used to evaluate the presence or absence of corals in areas having historical records; to quantitatively verify the habitat suitability model; and to enhance knowledge of the diversity and distributions of deep-sea corals in the region. These data will also provide the baseline information for a three-year research effort in the Northeast funded by NOAA's Deep-Sea Coral Research and Technology program.

"These are the first surveys in several decades for deep-sea corals and sponges in the mid-Atlantic," said David Packer, a marine ecologist at the NEFSC's James J. Howard Marine Sciences Laboratory at Sandy Hook, NJ. Packer participated in the *Bigelow* cruise, and was excited about the amount and variety of corals, sponges, and related marine life encountered during the survey and the importance of these findings for the future of deep-sea coral research in the region. "We previously had little or no data about some of the canyons or the available data were decades old, so what we learned in just a few weeks provided a 'quantum leap' in our knowledge about the canyons and their habitats."

The modeling effort to develop the predictive habitat suitability maps was conducted by Amy Drohan at the NEFSC's Sandy Hook lab and Brian Kinlan and Matt Poti, both at NOS. Kinlan participated in the *Bigelow* cruise and was able to use his expertise to interpret the model findings in the field as well as help guide the search for coral hotspots.

Although the July cruise focused on only a few of the canyons mapped using multibeam sonar, the researchers will also use the bathymetry data collected by the *Okeanos Explorer* and the *Hassler* at other deepwater canyons to refine and revise their coral model. In fact, work has already started on a revised model incorporating the new findings.

"Like the hub of a wheel with many spokes, the July *Bigelow cruise* was central to a project that seemed to grow over time as opportunities arose to leverage resources and use these to their fullest potential," said Nizinski, who has studied deepwater coral habitats off Florida, off the North Carolina coast, and in the Gulf of Mexico.

"What originally started with 16 days of ship time, provided and funded by the Northeast Fisheries Science Center to explore deepwater canyons off the Northeast coast, rapidly developed into a much larger project," Nizinski said. "What started as informal discussions between NOAA and colleagues led to a major field program that first surveyed and mapped deep-sea canyons along the northeast continental shelf and slope, followed by underwater observations to verify coral occurrence. We are excited about the possibilities given the results from this first cruise."

Three NOAA line offices contributed to this deepwater canyon /coral project: NOAA Fisheries Service through the Northeast Fisheries Science Center (NEFSC) and the Office of Habitat Conservation; Ocean and Atmospheric Research's (OAR) Office of Ocean Exploration and Research; and the National Ocean Service's (NOS) Office of Coast Survey and the National Centers for Coastal Ocean Science, Center for Coastal Monitoring and Assessment's Biogeography Branch. OAR and NOS were primarily involved through the ACUMEN Project in gathering current multibeam maps of the deepwater canyons. Vessel support (NOAA ships *Okeanos Explorer, Ferdinand R. Hassler,* and *Henry B. Bigelow*) was provided by NOAA's Office of Marine and Aviation Operations (OMAO).

In addition to scientists from NEFSC and WHOI, cruise participants represented the NOS Biogeography Branch, the NOAA Office of Ocean Exploration, the Delaware Museum of Natural History, and the NOAA Teacher at Sea program. Kathleen DeLussey, a reading specialist at the James R. Lowell Elementary School in Philadelphia, Pa., chronicled her adventures at sea on her NOAA Teacher at Sea web site and blogs.

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Related links:

National Systematics Laboratory: http://www.nefsc.noaa.gov/nsl/mainpage/index.html

Atlantic Canyons Undersea Mapping Expeditions (ACUMEN): http://oceanexplorer.noaa.gov/okeanos/explorations/acumen12/background/plan/welcome.html

Deep-Sea Corals: http://www.habitat.noaa.gov/protection/corals/deepseacorals.html

NOAA Habitat Blueprint: http://www.habitat.noaa.gov/blueprint/index.html

NOAA Regional Habitat Initiatives- Northeast: Deep-sea Corals Conservation: http://www.habitat.noaa.gov/blueprint/initiatives.html

NOAA Ship *Henry B. Bigelow*: http://www.moc.noaa.gov/hb/